

**Robert H. Goddard Photograph
Collection, 1915 – 1940
0.15 cubic feet
JPL 212**

History

Dr. Robert H. Goddard was born on October 5, 1882 at Maple Hill in Worcester, Massachusetts. His family moved to Boston, Massachusetts in 1883, where he attended Mount Pleasant, Hugh O'Brien and English High Schools. Then in 1898 his family moved back to Maple Hill, which is when he began thinking about flight into outer space. From 1901 – 1904, he was a student at South High School in Worcester and received his Bachelor Science Degree at Worcester Polytechnic Institute in 1908. From 1909 – 1911, he attended Clark University where he received his Masters in 1910 and Ph.D. in 1911. Goddard first explored mathematically the practicality of using rockets to reach high altitudes and escape velocity while he was a Research Instructor in Physics at Princeton University from 1912 – 1913. From 1914 – 1920 he was an Instructor, Assistant Professor and Associate Professor respectively.

Goddard is considered the father of modern rocket propulsion in the United States. Along with Konstantine Eduardovich Tsiolkovsky of Russia and Hermann Oberth of Germany, Goddard envisioned the exploration of space. A physicist of great insight, Goddard also had an unique genius for invention.

Goddard first obtained public notice in 1907 in a cloud of smoke from a powder rocket fired in the basement of the physics building in Worcester Polytechnic Institute. School officials took an immediate interest in the work of student Goddard. They, to their credit, did not expel him. He thus begun his lifetime of dedicated work.

In 1914, Goddard received two U.S. patents. One was for a rocket using liquid fuel. The other was for a two or three stage rocket using solid fuel. At his own expense, he began to make systematic studies about propulsion provided by various types of gunpowder. His classic document was a study that he wrote in 1916 requesting funds of the Smithsonian Institute so that he could continue his research. This was later published along with his subsequent research and Navy work in a Smithsonian Miscellaneous Publication No. 2540 (January 1920). It was entitled "A Method of Reaching Extreme Altitudes". In this treatise, he detailed his search for methods of raising weather recording instruments higher than sounding balloons. He related how he developed the mathematical theories of rocket propulsion.

Towards the end of his 1920 report, Goddard outlined the possibility of a rocket reaching the Moon and exploding a load of flash powder there to mark its arrival. The bulk of his scientific report to the Smithsonian was a dry explanation of how he used the \$5,000 grant in his research. Yet, the press picked up Goddard's scientific proposal about a rocket flight to the Moon and ridiculed it concerning the feasibility of such a thing. Goddard reacted to this ridicule with a reticence about disclosure of future research which he held for the rest of his life.

Several scores of the 1750 copies of the 1920 Smithsonian report reached Europe where it was read by members of the German Rocket Society which was formed in 1927. The German Army began its rocket program in 1931.

In 1926 Goddard constructed and tested successfully the first rocket using liquid fuel. Indeed, the flight of Goddard's rocket on March 16, 1926, at Auburn, Massachusetts, was a feat as epochal in history as that of the Wright brothers at Kitty Hawk. Yet, it was only one of Goddard's "first" of significance in rocket propulsion in the fields of military missilery and the scientific exploration of space.

GODDARD'S HISTORIC FIRSTS:

Robert H. Goddard's basic contribution to missilery and space flight is a lengthy list. As such, it is an eloquent testimonial to his lifetime of work in establishing and demonstrating the fundamental principles of rocket propulsion. Some of his historic firsts are as follows:

He first shot a scientific payload (barometer and camera) in a rocket flight in Auburn, Massachusetts, (1929).

He first used vanes in the rocket motor blast for guidance in New Mexico, (1932).

He first developed gyro control apparatus for rocket flight in New Mexico, (1932).

He first received U.S. patent in idea of multi-stage rocket, (1914).

He first developed pumps suitable for rocket fuels.

He first launched successfully a rocket with a motor pivoted on gimbals under the influence of a gyro mechanism, (1937).

Goddard's greatest engineering contributions were made during his work in the 1920's and 1930's. He received a total of \$10,000 from the Smithsonian by 1927 and through the personal efforts of Charles A. Lindbergh, he subsequently received financial support from the Daniel and Florence Guggenheim Foundation. Progress on all of his work was reported in "Liquid Propellant Rocket Development", which was published by the Smithsonian in 1936.

As primitive in their day as the achievement of the Wrights in theirs, Goddard's rockets made little impression upon U.S. government officials. Only through the modest subsidies of the Smithsonian Institution and the Daniel Guggenheim Foundation, as well as the leaves of absence granted him by Worcester Polytechnic Institute of Clark University, was Goddard able to sustain his lifetime of devoted research and testing. He worked for the U.S. Navy in both World Wars.

Eighteen years after his successful demonstration at Auburn, Goddard's pioneering achievements saw a practical manifestation in the German V-2 ballistic missile. Goddard's work largely anticipated in technical detail the German V-2, including gyroscopic control, steering by means of vanes in the jet stream of the rocket motor, gimbalsteering, power-driven fuel pumps and other devices. His rocket flight in 1929 carried the first scientific payload, a barometer and a camera.

Goddard had also developed and demonstrated the basic idea of the bazooka two days before the Armistice in 1918 at the Aberdeen Proving Grounds. His launching platform was a music rack. Dr. Clarence N. Hickman, a young Ph.D. from Clark University, worked with Goddard in 1918 provided continuity to the research that produced this weapon for use in World War II.

On July 1932, Goddard took a leave of absence from Clark University to conduct full time rocket research at a field named "Eden Valley" in Roswell, New Mexico. He and his wife bought a ranch, which they named "Mescalero Ranch" and they lived there until 1941.

Charles Lindbergh had visited Goddard in New Mexico and was sufficiently impressed to persuade Daniel Guggenheim a grant of \$50,000. With this, Goddard set up an experiment station in a lonely spot near Roswell, New Mexico. Here he built larger rockets and developed many of his ideas that are now standard in rocketry. He designed combustion chambers of the appropriate shape, and burned gasoline with oxygen in such a way that the rapid combustion could be used to cool the chamber walls. There, from 1930 to 1935 he launched rockets that attained speeds of up to 550 miles an hour and heights of a mile and a half. He developed systems for steering a rocket in flight by using a rudder-like device to deflect the gaseous exhaust, with gyroscopes to keep the rocket headed in the proper direction. He patented this device as a multistage rocket.

In World War II, Goddard again offered his services to his nation and was assigned by the U.S. Navy to the development of practical jet assisted takeoff (JATO) and liquid propellant rocket motors capable of variable thrust. In both areas, he was successful. He died of throat cancer on August 10, 1945.

Goddard was the first scientist who not only realized the potentialities of missiles and space flight, but also contributed directly in bringing them to practical realization. Goddard had talents in both creative science and practical engineering that places him above the European rocket pioneers. His labor went largely unrecognized in the United States until after his death. The NASA Goddard Space Flight Center at Greenbelt, Maryland was named in his honor on May 1, 1959. On September 16, 1959, the U.S. Congress authorized the issuance of a gold medal in his honor.

Provenance

In February 1975, an unnamed person from NASA's Audio Visual section visited with Goddard's wife and arranged to obtain a pictorial history of Dr. Goddard. On October 5, 1976, the photographs thereby collected were forwarded to Dr. Carl Sagan at JPL, who then forwarded them to JPL Section 181, Media Relations Office. They remained a part of the office collection of Jurrie van der Woude of the Media Relations Office until they were transferred to the JPL Archives on March 23, 2001 as part of Accession 2001-7 from van der Woude's office.

Collection Arrangement and Description

The collection contains ninety-three 8" by 10" and one 5" by 7" black and white photographs, depicting the history of the life of Dr. Robert Goddard and showing the development of his rockets. In 1975, Mrs. Goddard gave NASA permission to duplicate and release the photographs to the news media. On the reverse side of most of the photographs is a written description of the individual picture, along with a brief biographical background of Dr. Goddard and a NASA publication release notice, a date and a NASA photograph identification number.

The collection is arranged in 8 file folders and filed in chronological order. All the photographs in the collection are in good condition.

Conservation/Preservation

Standard preparations of documents for long term storage were completed.

Separation Statement

No materials were separated from the collection.

Finding Aids

No other finding aids exist.

FILE FOLDER LIST

Box 1 of 1

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| Fld 1 | NASA Memorandum, re: Mrs. Robert Goddard's release of photographs, depicting a pictorial history of the life of her husband showing the development of the rocket, February 11, 1975. |
| Fld 2 | Portraits of Dr. Robert H. Goddard; Goddard's family home in Worcester, Massachusetts; Goddard standing in front of one of his scientific formulas; Worcester Sunday Telegram clippings. |
| Fld 3 | Photographs depicting Dr. Goddard's activities from 1915 - 1918. |
| Fld 4 | Photographs depicting Dr. Goddard's activities from August 1925 – 1930. |
| Fld 5 | Photographs depicting Dr. Goddard's activities from 1930 – September 1934. |
| Fld 6 | Photographs depicting Dr. Goddard's activities from 1935 – October 29, 1935. |

Fld 7 Photographs depicting Dr. Goddard's activities from January 14, 1937 – November 7, 1936.

Fld 8 Photographs depicting Dr. Goddard's Activities during the 1940s.

CATALOG DESCRIPTION

Robert H. Goddard Photograph Collection, 1915-1940

0.15 c.f. (8 folders)

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Register available in the repository.

Tracings

National Aeronautics and Space Association (U.S.) – History of Rocketry

U.S. History of Rocketry

Goddard, Robert H. Dr.

Accession No. 2001-7